# EXHIBIT Q

<u>IN ...E UNITED STATES PATENT OF. :E</u>

155 East 44th Street
New York, New York 10017
January 8, 1973

In re application of Francis deS. Lynch et al.

Serial No. 236,318

Filed    March 20, 1972

For  GOLF BALL DIMPLE SPATIAL RELATIONSHIP

THE COMMISSIONER OF PATENTS
Washington, D.C. 20231

Sir:

Transmitted herewith is an amendment in the above-identified application.

☐ No additional fee is enclosed because this application was filed prior to
October 25, 1965 (effective date of Public Law 89-83.)

☒ No additional fee is required.

The fee has been calculated as shown below.

| | (1) | (2) CLAIMS REMAINING AFTER AMENDMENT | (3) | (4) HIGHEST NO. PREVIOUSLY PAID FOR | (5) PRESENT EXTRA | (6) RATE | (7) ADDITIONAL FEE |
|---|---|---|---|---|---|---|---|
| | | | | CLAIMS AS AMENDED | | | |
| TOTAL CLAIMS | | * | MINUS | ** | = | X $2 | X |
| INDEP. CLAIMS | | * | MINUS | | = | X $10 | X |
| | | | | TOTAL ADDITIONAL FEE FOR THIS AMENDMENT | | | |

*If the entry in Column 2 is less than the entry in Column 4, write "0" in Column 3.
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EYRE, MANN & LUCAS

By: _____

David L. Just, Reg. No. 25,687

# MISSING PAGE(S) FROM THE

# U.S. PATENT OFFICE

# OFFICIAL FILE WRAPPER

*Paper # 6 pg. 1*

Patent Imaging Corporation
*Patent Legal and Scientific Information Service*
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BSP098018

In the Claims:

1. (amended)  In a finished golf ball having dimples, the improvement which comprises having at least about 80% of the distances between the closest points of the edges of adjacent dimples less than about 0.065 inches and at least about 55% of the distances between the closest points of the edges of adjacent dimples greater than about 0.001 inches the edge of the dimple being defined as the point of intersection of the periphery of the golf ball or its continuation intersects a tangent to the sidewall of the dimple at a point about 0.003 inches below the periphery of the golf ball or its continuation.

4. (amended)  The golf ball of claim 1 wherein the [dimples are round] edge of each dimple is circular.

5. (amended)  A finished golf ball having from about 182 to 332 dimples, the depth, diameter and number of dimples being defined by the relationship

$$S = \left[\frac{831.5\ (d-x) - 55.56\ (D-y)}{a}\right]^2 + \left[\frac{83.15\ (D-y) + 555.6\ (d-x)}{b}\right]^2$$

wherein:

    S = a value of 0 to 1.0

    d = average depth of all dimples

    D = average diameter of all dimples

    $x = 0.000315N^2 - 0.00304N + 0.0175$

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$y = 0.00639N^2 - 0.0642N + 0.296$

$a = 0.777N^2 - 3.66N + 6.69$

$b = 0.284N^2 + 0.875N + 1.10$

$N$ = the total number of dimples

and the placement of the dimples being such that at least about 80% of the distances between the closest points of the edges of adjacent dimples is less than about 0.065 inches and at least about 55% of the distances between the closest points of adjacent dimples is greater than about 0.001 inches the edge of the dimple being defined as the point of intersection of the periphery of the golf ball or its continuation (intersects) a tangent to the sidewall of the dimple at a point about 0.003 inches below the periphery of the golf ball or its continuation.

8. (amended)  The golf ball of claim 5 wherein the [dimples are round] edge of each dimple is circular.

9. (amended)  A finished golf ball having from 333 to about 392 dimples, the depth, diameter and number of dimples being defined by the relationship

$$S = \left[ \frac{831.5\,(d-x) - 55.56\,(D-y)}{a} \right]^2 + \left[ \frac{83.15\,(D-y) + 555.6\,(d-x)}{b} \right]^2$$

wherein:

$S$ = a value of 0 to 1.0

$d$ = average depth of all dimples

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D = average diameter of all dimples

x = 0.0144-0.00103N

y = 0.242-0.0267N

a = 5.31-0.667N

b = 1.57-0.208N

N = the total number of dimples

and the placement of the dimples being such that at least about 80% of the distances between the closest points of the edges of adjacent dimples is less than about 0.065 inches and at least about 55% of the distances between the closest points of adjacent dimples is greater than about 0.001 inches the edge of the dimple being defined as the point of intersection of the periphery of the golf ball or its continuation intersects a tangent to the sidewall of the dimple at a point about 0.003 inches below the periphery of the golf ball or its continuation.

12. (amended)  The golf ball of claim 9 wherein the [dimples are round] edge of each dimple is circular.

13. (amended)  A finished golf ball having from about 182 to 332 dimples, the depth, diameter and number of dimples being defined by the relationship

$$ S = \left[ \frac{831.5\ (d-x) - 55.56\ (D-y)}{a} \right]^2 + \left[ \frac{83.15\ (D-y) + 555.6\ (d-x)}{b} \right]^2 $$

wherein:

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S = a value of 0 to 1.0

d = average depth of all dimples

D = average diameter of all dimples

$x = 0.000315N^2 - 0.00304N + 0.0175$

$y = 0.00639N^2 - 0.0642N + 0.296$

$a = 0.490N^2 - 1.98N + 3.69$

$b = 0.0896N^2 + 0.211N + 0.788$

N = the total number of dimples

and the placement of the dimples being such that at least about 80% of the distances between the closest points of the edges of adjacent dimples is less than about 0.065 inches and at least about 55% of the distances between the closest points of adjacent dimples is greater than about 0.001 inches the edge of the dimple being defined as the point of intersection of the periphery of the golf ball or its continuation intersects a tangent to the side-wall of the dimple at a point about 0.003 inches below the periphery of the golf ball or its continuation.

16. (amended)  The golf ball of claim 13 wherein the [dimples are round] edge of each dimple is circular.

17. (amended)  A finished golf ball having from 333 to about 392 dimples, the depth, diameter and number of dimples being defined by the relationship

$$S = \left[\frac{831.5\ (d-x) - 55.56\ (D-y)}{a}\right]^2 + \left[\frac{83.15\ (D-y) + 555.6\ )d-x)}{b}\right]^2$$

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wherein:

S = a value of 0 to 1.0

d = average depth of all dimples

D = average diameter of all dimples

x = 0.0207-0.00293N

y = 0.195-0.0125N

a = 12.2-2.92N

b = 1.33-0.250N

N = the total number of dimples

and the placement of the dimples being such that at least about 80% of the distances between the closest points of the edges of adjacent dimples is less than about 0.065 inches and at least about 55% of the distances between the closest points of adjacent dimples is greater than about 0.001 inches the edge of the dimple being defined as the point of intersection of the periphery of the golf ball or its continuation intersects a tangent to the sidewall of the dimple at a point about 0.003 inches below the periphery of the golf ball or its continuation.

20. (amended)  The golf ball of claim 17 wherein the [dimples are round] edge of each dimple is circular.

## PROVISIONAL SPECIES ELECTION

The applicants provisionally elect the species of Group I and respectfully traverse the requirement for restriction.  The applicants further respectfully

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submit that the species of Group III is totally included within the elected species of Group I.

The claims readable on the elected species of Group I include claims 5, 6, 7, and 8.

### REMARKS

It is perhaps best to start with a discussion of the invention of the present case since it appears that the Examiner may not understand the invention which the applicants are claiming. The applicants' invention is not specific dimple configurations but is rather the spatial arrangement of the dimples on the surface of a golf ball. The applicants have found that a reduction in fret area of a golf ball increases the total distance which the golf ball will travel all other conditions being equal. The applicants have defined this in Claim 1 by stating how close adjacent dimples should be positioned to each other. The Examiner will appreciate that the size of the dimple will depend upon the number of dimples since the distance between adjacent dimples must fall within the limitations of the claims. Therefore, where there are a small number of dimples the diameter of each dimple will be quite large in order to meet the limitations of the claims as to the distance between adjacent dimples. Similarly, where the number of dimples is high the diameter of the dimples will be correspondingly low so that there will not

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be too many overlapping dimples. This limitation is expressed in Claim 1 by stating that at least 55% of the dimples must be at least 0.001 inches from each other.

In connection with this, it is pointed out that the Examiner's statement in paragraph six of the Office Action that "claims 1-4 could recite but two of applicants' dimples on the prior art balls" is quite incorrect. The reason for this is that the applicants are not claiming any particular dimples but are rather claiming the positioning of the dimples on the ball. Claim 1 specifically provides that 80% of the dimples on the ball must be no greater than 0.065 inches apart and this would certainly cover more than two dimples.

The Examiner's attention is further directed to Figs. 1 and 2 of the drawings. Fig. 1 shows a prior art ball and it can be seen in Fig. 1 that the dimples are spaced relatively far from each other. In contrast to this, Fig. 2 shows a ball with dimples positioned in accordance with the present invention and the balls are positioned quite close to each other. The Examiner will further note that whereas many of the dimples of Fig. 1 are arranged in rectangular boxes it is not possible to do this with the dimple arrangement of the present invention since the edges of adjacent dimples would not fall within the limitations of the claims. Keeping in mind the

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applicants' invention of spatial positioning of the dimples
as opposed to specific dimple configurations, we turn to
the Examiner's species election requirement.  The Examiner
has required election between the four different formulas
which the applicants have given for the depth to diameter
relationship of the dimples stating that each is a patent-
ably distinct species.  The applicants have given depth
to diameter relationships for the dimples to further
define their invention but yet the invention itself is
the arrangement of dimples on the surface of the golf
ball and not the depth to diameter relationship.  Formulas
1 and 3 (claims 5 and 13 respectively) cover golf balls
having 182-332 dimples whereas Formulas 2 and 4 (claims
9 and 17 respectively) cover golf balls having 333-392
dimples.  For these specific numbers of dimples the appli-
cants have found that excellent results are achieved when
the depth to diameter relationship of the dimples is
within the formulas given.

In view of the fact that the applicants' invention
is not these formulas but is rather the spatial relationship
of the dimples as defined in Claim 1, it is respectfully
submitted that the species election requirement is im-
proper and it is respectfully requested that it be with-
drawn.

The applicants take especially sharp issue with
the species election requirement between Formulas 1 and
3 and between Formulas 2 and 4.  All of the dimples of

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. . . .

Formula 3 will necessarily also fall within Formula 1 since Formula 3 is simply a small part of Formula 1 and delineates the best results which can be obtained with Formula 1. Similarly, all of the dimples which fall within Formula 4 will also be included in Formula 2 since Formula 4 defines the best results which can be obtained with dimples which fall within Formula 2. Therefore, even if the Examiner maintains the species requirement between Formula 1 and Formula 2, it is respectfully submitted that Formula 3 should be included within the species of Formula 1 and Formula 4 should be included within the species of Formula 2.

With respect to Rule 141 it is pointed out that all of the independent species claims (claims 5, 9, 13, and 17) which the Examiner has established, include all of the limitations of generic Claim 1.

Further discussion of the present case will be limited to claims 1 and 5 and the claims dependent thereon since these claims are drawn to the generic and the elected species. The Examiner will understand, however, that the comments made with respect to Claim 5 apply with equal validity to Claims 9, 13, and 17 and the claims dependent thereon and especially to Claim 13 and the claims dependent thereon since Claim 13 is entirely included within Claim 5.

In paragraph one of the Office Action the Examiner

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BSP098027

has stated that the claims are not adequately particular since "S" could never equal "O" in a "dimpled" ball. The Examiner is incorrect in this regard. In Formula 1, S will equal O when the number of dimples known or desired (N) is substituted into the following expressions:

$$d = 0.000315N-0.00304N^2+0.0175$$
$$D = 0.00639N-0.0642N^2+0.296$$

It is pointed out that this same substitution may also be made in Formula 3 and this further shows that Formula 3 is included within Formula 1.

The Examiner has stated that the location of the "edges" is not ascertainable from the claims and in accordance therewith the applicants have added to the claims the definition of the edge of the dimple as given in the specification.

The Examiner has stated that the word "round" could define any circuitous path and to eliminate any confusion concerning this the appropriate claims have been changed to read that the "edge of each dimple is circular."

The Examiner's statement that point "N" in Fig. 17 has been given no function is not understood. On page 16 of the specification lines 19-20 it is stated that point N is the deepest point of the dimple shown in Fig. 17. Further in the same paragraph there is described the manner in which the irregularly shaped dimple of Fig. 17 is treated in accordance with the present invention.

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It is respectfully submitted the function of point N is adequately treated in the specification.

With respect to whether or not the measurements are taken after the ball is finished by conventional painting, this will depend upon whether or not a painting step is employed. Obviously the flight characteristics of a golf ball are affected by the finished ball and not by some configuration during the manufacturing steps. To remove any error concerning this, the applicants have amended the claims to state that the ball claimed is a finished ball. The Examiner will understand that this will normally include the conventional painting step but that in certain instances, such as with some of the newer solid balls where painting is not necessary, a finished ball could be an unpainted ball.

The Examiner states that the applicants have failed to specify where all points of measurements are located for all shapes. The applicants respectfully disagree with this statement by the Examiner. For dimples which are a section of a sphere the applicants have explained where the measurements are made in Figs. 3, 4, and 5.

For dimples which are not a section of a sphere, the applicants have explained that the dimples are converted to the shape of a section of a sphere and then the measurements are made in accordance with Figs. 3, 4, and 5. The conversion of irregularly shaped dimples to

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BSP098029

spherically shaped dimples is delineated in Figs. 15, 16, 17, and 18. It is believed these figures adequately disclose how to make measurements in accordance with the present invention. If it is the Examiner's position that each of these balls must be included in the claims, then the applicants respectfully disagree with the Examiner's position. It is certainly necessary that every feature of the invention be included in the claims but it is equally unnecessary to include in the claims the method of making various measurements. For example, in a claim for a polyurethane slab it is certainly considered sufficient if a Shore "A" hardness is given without describing the complete Shore A test in the claim. As a matter of fact, since the Shore A test is a well known and accepted industry test for hardness, it is not even necessary to describe how this measurement is made in the specification. In the instant case, the applicants readily agree that their method of measuring dimples is not a standard procedure such as the Shore Hardness test. This is the reason that the applicants have carefully detailed in the specification the manner in which dimples according to the present invention are to be measured. Having defined the way in which the dimples are to be measured in the specification, it is certainly not necessary to include all of these definitions in the claims for the same reason that it is not necessary to set forth the

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complete Shore A test for hardness every time a Shore A
value is claimed.

The Examiner has stated that the drawings fail to
illustrate every feature claimed. The Examiner has
further suggested that the drawings be amended to show
each of Examples 1-8. This requirement is not understood.
Examples 1-8 show various workings of Formulas 1-4 of
previous pages of the specification. These formulas are
fully defined on pages 4 and 5 and the examples are only
intended to show substitution of actual numbers into the
formulas. Referring for instance to Examples 1 and 2, the
diameter in both cases was the same and the depth of Example
1 was 0.0145 inches whereas the depth of Example 2 was
0.0135 inches. It is not understood how drawings showing
a difference of one-thousandth of an inch in the depth of
the dimple would help to facilitate an understanding of
the present invention. The eight examples given are simply
representative of a number of depth to diameter relationships
which are included in the present invention. These depth
to diameter relationships are defined by the formulas. It
is pointed out that the claims are directed to the formulas
and not to these specific examples. It is further pointed
out that Figs. 3, 4, and 5 describe the method of measuring
the edge of the dimple and the depth and diameter of the
dimple. Fig. 2 shows the fret area of various adjacent
dimples and Fig. 2 also illustrates overlapping dimples

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BSP098031

36 and 38.  It is further pointed out that Examples 1-8
do not show the land dimensions of the examples and the
land dimensions are determined by spacing the dimples so
that the edges of the dimples are within the distances
stated in Claim 1.  This spacing of the dimples is con-
veniently done with the use of an icosahedron as described
in Examples 10, 11, 12, and 13.  It is further not under-
stood how amendment to the drawings to include each of
Examples 1-8 will facilitate an understanding of the
invention.  As previously mentioned, the invention is
the land distances and not the depth to diameter relation-
ships of the dimples.  Since the examples only deal with
the depth to diameter relationships of the dimples, the
examples deal only with a feature of the invention and
not with the basic invention itself.

The Examiner has stated that Fig. 1 must be labeled
"prior art."  The labeling of this figure is not necessary
to an understanding of the present invention and it is
therefore respectfully requested that compliance with
this be deferred until an indication of allowable subject
matter.  At that time, the applicants will prepare the
necessary authorization to the draftsman to make this
change.

An objection to the Abstract has been made and the
Abstract has been rewritten to be substantially co-
extensive with Claim 1.

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BSP098032

The Examiner has stated that references B, C, D, E, L, and M show concepts of applicants' dimples. The applicants will not take issue with this at the present time since the applicants' invention is not the dimples themselves but rather the spatial relationship of the dimples on the surface of a golf ball.

This leaves reference A which the Examiner has applied under both 102 and 103. The Examiner has stated that the claims could be said to define only inherent characteristics of A's ball. The applicants have in their possession balls made under this patent and have measured the distances between the edges of adjacent dimples on these balls. The distances between the edges of adjacent dimples on A's actual balls and on the broadest disclosure of A's ball as given in the specification still have more than 50% of the distances between the edges of adjacent dimples above 0.065 inches. This is in direct contradistinction to the applicants' claims where no more than 20% of the distances between the closest points of the edges of adjacent dimples can be greater than 0.065 inches (defined in the claims as at least 80% being less than 0.065 inches). Since A's ball does not fall within the limitations of the claims, there is no question that the applicants' invention is not anticipated under 102 and the only question is obviousness under 103. There is nothing in the A reference which indicates or even gives the remotest suggestion that

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when land distances between adjacent dimples are controlled
as specified in the applicants' claims the golf ball will
travel further, all other conditions being equal.  In view
of this, it is not seen how the applicants' balls could
be said to be obvious in view of A.

In view of the foregoing it is respectfully requested
that the species election requirement be withdrawn and
it is respectfully submitted that all of the claims are
allowable.  A reconsideration and allowance are respectfully
requested.

                              Respectfully submitted,

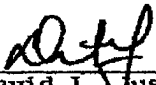                              EYRE, MANN & LUCAS

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(212) 682-4980                      David L. Just
                              Registration No. 25,687

-17-

# EXHIBIT R

**PATENTS**

205 East 42nd Street
New York, New York 10017
June 10, 1986

In re application of FRancis deS. Lynch et al.

Serial No. 713,298                     Group Art Unit:  131

Filed    March 18, 1985                Examiner:  C. Weston

For    GOLF BALL DIMPLE SPATIAL RELATIONSHIP

THE COMMISSIONER OF PATENTS
Washington, D.C. 20231

Sir:

Transmitted herewith is an amendment in the above-identified application.

[ ] No additional fee is enclosed because this application was filed prior to October 25, 1965 (effective date of Public Law 89-83.)

[ ] No additional fee is required.

The fee has been calculated as shown below.

| | (1) | (2) CLAIMS REMAINING AFTER AMENDMENT | (3) | (4) HIGHEST NO. PREVIOUSLY PAID FOR | (5) PRESENT EXTRA | (6) RATE | (7) ADDITIONAL FEE |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| TOTAL CLAIMS | | 16 | MINUS | 20 | = 0 | x 2.00 | x 0.00 |
| INDEP. CLAIMS | | 4 | MINUS | 3 | = 1 | x 34.00 | x 34.00 |
| | | | | TOTAL ADDITIONAL FEE FOR THIS AMENDMENT→ | | | $34.00 |

*If the entry in Column 2 is less than the entry in Column 4, write "0" in Column 5.
**If the "Highest Number Previously Paid For" IN THIS SPACE is less than 10, write "10" in this space.

[XX] A check in the amount of $ 34.00        is attached.

[ ] Charge $              to Deposit Account No._____. A duplicate copy of this sheet is enclosed.

Please charge any additional fees or credit overpayment to Deposit Account No. 05-1675 . A duplicate copy of this sheet is enclosed.  This is a general authorization which includes any fees under 37 CFR 1.16 - 1.18 for the entire pendency of the application.

LUCAS & JUST

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PATENTS

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Francis deS. Lynch et al.          Docket No. A-29F-A

Serial No. 713,298                 Group Art Unit:  131

Filed:  March 18, 1985             Examiner:  C. Weston

For:  GOLF BALL DIMPLE SPATIAL RELATIONSHIP

I hereby certify that this correspondence is being deposited with
the U. S. Postal Service as first class mail in an envelope address-
ed to: Commissioner of Patents and Trademarks, Washington,
D. C. 20031 on June 10, 1986

............................          205 East 42nd Street
William D. Lucas    David L. Just    New York, New York  10017
Atty/R.N. 17,721    Atty/R.N. 25,687.  June 9, 1986

Hon. Commissioner of Patents and Trademarks
Washington, D.C.  20231

Sir:

        This is in response to the Office Action dated
March 10, 1986.

        In the Claims:

        Please cancel claims 25 and 30.

        Please amend the claims as follows:

        26.  The method of claim 33 wherein the positioning
of the selected dimples in the surface of the golf ball
is such that 100% of the closest distances between the
edges of adjacent dimples is less than 0.065 inches.

        27.  The method of claim 33 wherein the positioning
of the selected dimples in the surface of the golf ball

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is such that 100% of the closest distances between the edges of adjacent dimples is greater than 0.001 inches.

28.   The method of claim 33 wherein x, y, a and b are defined by the following relations as functions of N:

$$y = 0.323 - 0.0896 N + 0.0122 N^2$$
$$x = 0.0186 - 0.00406 N + 0.000550 N^2$$
$$a = 4.54 - 2.78 N + 0.674 N^2$$
$$b = 3.09 - 1.97 N + 0.412 N^2.$$

29.   The method of claim 33 wherein x, y, a and b are defined by the following relations as functions of N:

$$x = 0.0225 - 0.00340 N$$
$$y = 0.240 - 0.0242 N$$
$$a = 13.6 - 3.28 N$$
$$b = 5.25 - 1.25 N.$$

31.   The method of claim 34 wherein the positioning of the selected dimples on the surface of the golf ball is such that 100% of the closest distances between the edges of adjacent dimples is less than 0.065 inches.

32.   The method of claim 34 wherein the positioning of the selected dimples on the surface of the golf ball is such that 100% of the closest distances between the edges of adjacent dimples is greater than 0.001 inches.

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Please add the following new claims:

33.  The method of selecting the number of dimples, the diameter and depth of the dimples, and of placing said dimples on a golf ball, the improvement comprising:

(a)   selecting the number of dimples to be used, the said number of dimples being between 182 and 392;

(b)  selecting a dimple diameter and dimple depth that satisfy the following relationship:

$$S = [\frac{831.5(d-x)-55.56(D-y)}{a}]^2 + [\frac{83.15(D-y)+555.6(d-x)}{b}]^2$$

in which:

S = a value of 0 to 1.0

d = average depth of all dimples in inches

D = average diameter of all dimples in inches

and wherein:

a value N is obtained by dividing the exact number of dimples by 100, and x, y, a and b are defined by the following relations as functions of N:

when the number of dimples is between 182 and 332:

$$y = 0.323 - 0.0896N + 0.0122N^2$$

$$x = 0.0186 - 0.00406N + 0.000550N^2$$

$$a = 6.30 - 3.30N + 0.693N^2$$

$$b = 3.11 - 1.03N + 0.155N^2$$

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and when the number of dimples is between 333 and 392;

$$y = 0.287 - 0.0383N$$

$$x = 0.0162 - 0.00150N$$

$$a = 4.66 - 0.500N$$

$$b = 5.00 - 1.08N$$

(c)  positioning the selected dimples on the surface of the golf ball such that at least 80% of the distances between the closest points of the edges of adjacent dimples is less than about 0.065 inches, and at least 55% of the distances between the closest points of the edges of adjacent dimples is greater than 0.001 inches the edge of the dimples being defined as the point of intersection of the periphery of the golf ball or its continuation and a tangent to the sidewall of the dimples at a point 0.003 inches below the periphery of the golf ball or its continuation.

34.  The method of selecting the number of dimples, the diameter and depth of the dimples, and of placing said dimples on a golf ball, the improvement comprising:

(a)  selecting the number of dimples to be used, the said number of dimples being between 182 and 392;

(b)  selecting a dimple diameter and dimple depth that satisfy the following relationship:

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$$S = [\frac{831.5(d-x)-55.56(D-y)}{a}]^2 + [\frac{83.15(D-y)+555.6(d-x)}{b}]^2$$

in which:

$S$ = a value of 0 to 1.0

$d$ = average depth of all dimples in inches

$D$ = average diameter of all dimples in inches

and wherein:

a value N is obtained by dividing the exact number of dimples by 100, and $x$, $y$, $a$ and $b$ are defined by the following relations as functions of N:

$y = 0.156$

$x = 0.0117$

$a = 1.1$

$b = 0.55$

(c)  positioning the selected dimples on the surface of the golf ball such that at least 80% of the distances between the closest points of the edges of adjacent dimples is less than about 0.065 inches, and at least 55% of the distances between the closest points of the edges of adjacent dimples is greater than 0.001 inches the edge of the dimples being defined as the point of intersection of the periphery of the golf ball or its continuation and a tangent to the sidewall of the dimples at a point 0.003 inches below the periphery of the golf ball or its continuation.

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35.  A method of manufacturing a golf ball having dimples in the outer periphery thereof comprising the steps of:

(A) forming a golf ball into which dimples can be molded;

(B) determining the dimple number, dimple diameter and dimple depth by:

(a)  selecting the number of dimples to be used, the said number of dimples being between 182 and 392;

(b)  selecting a dimple diameter and dimple depth that satisfy the following relationship:

$$S = [\frac{831.5(d-x)-55.56(D-y)}{a}]^2 + [\frac{83.15(D-y)+555.6(d-x)}{b}]^2$$

in which:

S = a value of 0 to 1.0

d = average depth of all dimples in inches

D = average diameter of all dimples in inches

and wherein:

a value N is obtained by dividing the exact number of dimples by 100, and x, y, a and b are defined by the following relations as functions of N:

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when the number of dimples is between 182 and 332:

$$y = 0.323 - 0.0896N + 0.0122N^2$$

$$x = 0.0186 - 0.00406N + 0.000550N^2$$

$$a = 6.30 - 3.30N + 0.693N^2$$

$$b = 3.11 - 1.03N + 0.155N^2$$

and when the number of dimples is between 333 and 392:

$$y = 0.287 - 0.0383N$$

$$x = 0.0162 - 0.00150N$$

$$a = 4.66 - 0.500N$$

$$b = 5.00 - 1.08N$$

(C) making golf ball molds by positioning the selected dimples on the golf ball mold so that the surface of the golf ball made therefrom will have at least 80% of the distances between the closest points of the edges of adjacent dimples less than about 0.065 inches, and at least 55% of the distances between the closest points of the edges of adjacent dimples greater than 0.001 inches, the edge of the dimples being defined as the point of intersection of the periphery of the golf ball or its continuation and a tangent to the sidewall of the dimples at a point 0.003 inches below the periphery of the golf ball or its continuation.

(D) forming the dimples on the golf ball by molding the golf ball in the mold;

(E) removing the golf ball from the mold; and

(F) finishing the golf ball.

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36. The method of claim 35 wherein the positioning of the selected dimples in the surface of the golf ball is such that 100% of the closest distances between the edges of adjacent dimples is less than 0.065 inches.

37. The method of claim 35 wherein the positioning of the selected dimples in the surface of the golf ball is such that 100% of the closest distances between the edges of adjacent dimples is greater than 0.001 inches.

38. The method of claim 35 wherein x, y, a and b are defined by the following relations as functions of N:

$$y = 0.323 - 0.0896\ N + 0.0122\ N^2$$
$$x = 0.0186 - 0.00406\ N + 0.000550\ N^2$$
$$a = 4.54 - 2.78\ N + 0.674\ N^2$$
$$b = 3.09 - 1.97\ N + 0.412\ N^2.$$

39. The method of claim 35 wherein x, y, a and b are defined by the following relations as functions of N:

$$x = 0.0225 - 0.00340\ N$$
$$y = 0.240 - 0.0242\ N$$
$$a = 13.6 - 3.28\ N$$
$$b = 5.25 - 1.25\ N.$$

40. A method of manufacturing a golf ball having dimples in the outer periphery thereof comprising the steps of:

(A) forming a golf ball into which dimples can

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be molded;

(B) determining the dimple number, dimple diameter
and dimple depth by:

(a)  selecting the number of dimples to
be used, the said number of dimples being between
182 and 392;

(b)  selecting a dimple diameter and dimple
depth that satisfy the following relationship:

$$S = [\frac{831.5(d-x)-55.56(D-y)}{a}]^2 + [\frac{83.15(D-y)+555.6(d-x)}{b}]^2$$

in which:

S = a value of 0 to 1.0

d = average depth of all dimples in inches,

D = average diameter of all dimples in inches

and wherein:

a value N is obtained by dividing the exact
number of dimples by 100, and x, y, a and b
are defined by the following relations as functions
of N:

when the number of dimples is between 182
and 332:

$$y = 0.323 - 0.0896N + 0.0122N^2$$

$$x = 0.0186 - 0.00406N + 0.000550N^2$$

$$a = 6.30 - 3.30N + 0.693N^2$$

$$b = 3.11 - 1.03N + 0.155N^2$$

-9-

and when the number of dimples is between 333 and 392:

$$y = 0.287 + 0.0383N$$

$$x = 0.0162 - 0.00150N$$

$$a = 4.66 + 0.500N$$

$$b = 5.00 - 1.08N$$

(C) making golf ball molds by positioning the selected dimples on the golf ball mold so that the surface of the golf ball made therefrom will have at least 80% of the distances between the closest points of the edges of adjacent dimples less than about 0.065 inches, and at least 55% of the distances between the closest points of the edges of adjacent dimples greater than 0.001 inches, the edge of the dimples being defined as the point of intersection of the periphery of the golf ball or its continuation and a tangent to the sidewall of the dimples at a point 0.003 inches below the periphery of the golf ball or its continuation.

(D) forming the dimples on the golf ball by molding the golf ball in the mold;

(E) removing the golf ball from the mold; and

(F) finishing the golf ball.

41.  The method of claim 40 wherein the positioning of the selected dimples on the surface of the golf ball is such that 100% of the closest distances between the edges of adjacent dimples is less than 0.065 inches.

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42.  The method of claim 40 wherein the positioning
of the selected dimples on the surface of the golf ball
is such that 100% of the closest distances between the
edges of adjacent dimples is greater than 0.001 inches.

## REMARKS

The applicants' invention relates to the positioning
of golf ball dimples on a golf ball and the number of
dimples, the diameter of the dimples, and the depth of
the dimples, all of the foregoing parameters being interrelated.
The claims of the present invention are directed to a
method of making a golf ball in accordance with the foregoing.

The only rejection of applicants' claims which the
Examiner has made is under 35 U.S.C. 112 as being indefinite
for not having specific steps of making a golf ball.
As recognized by the Examiner, the applicants' claims
"define the method of selecting the number of dimples,
the diameter and depth of the said dimples, and the subsequent
step of placing said dimples on the surface of a golf
ball" (emphasis added).  It is respectfully submitted
that applicants' claims as originally presented define
a method.  However, it is agreed that the method as defined
is one of the positioning of selected dimples on a golf
ball rather than the complete manufacture of a golf ball.
In accordance therewith, applicants have herewith amended
their claims to the method of selecting and positioning
the dimples on a golf ball.  Because of a typographical

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error in the formulas, amended claims 25 and 30 have been

presented herewith as new claims 31 and 32.  The only

change in substance is the change in the preamble pursuant

to the Examiner's comments in the Office Action.  Applicants

have also presented herewith a new set of claims which

is more definitive with respect to the making of a golf

ball as opposed to the selection and positioning of dimples.

As to support for the new set of claims, the Examiner's

attention is directed to page 18, lines 22-26 and page 21,

lines 6-18.

With respect to the filing of a supplemental oath

or declaration, applicants agree that the same will be

provided.  However, it is respectfully requested that

the requirement for this be deferred until an indication

of allowability.

Since the only objection in this case is under 35

U.S.C. 112 and since the objection under 35 U.S.C. 112

has been met herewith, it is respectfully submitted that

applicants' claims are in condition for allowance subject

only to submission of a supplemental oath.

Respectfully submitted,

LUCAS & JUST

By _____
   David L. Just
   Registration No. 25,687

DLJ:jah

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-12-

# EXHIBIT S

PATENTS

205 East 42nd Street
New York, New York 10017
January 12, 1987

In re application of Francis deS. Lynch et al.    Docket No. A-29F-A

Serial No.    713,298                           Group Art Unit:  131

Filed    March 18, 1985                         Examiner:  C. Weston

For    GOLF BALL DIMPLE SPATIAL RELATIONSHIP

GROUP 130

THE COMMISSIONER OF PATENTS
Washington, D.C. 20231

Sir:

Transmitted herewith is an amendment in the above-identified application.

☐ No additional fee is enclosed because this application was filed prior to
October 25, 1965 (effective date of Public Law 89-83.)

☐ No additional fee is required.

The fee has been calculated as shown below.

| | (1) | (2) CLAIMS REMAINING AFTER AMENDMENT | (3) | (4) HIGHEST NO. PREVIOUSLY PAID FOR | (5) PRESENT EXTRA | (6) RATE | (7) ADDITIONAL FEE |
|---|---|---|---|---|---|---|---|
| TOTAL CLAIMS | | * | MINUS | ** | = | X 12.00 | x |
| INDEP. CLAIMS | | * | MINUS | | = | X 34.00 | x |
| | | | | TOTAL ADDITIONAL FEE FOR THIS AMENDMENT➤ | | | |

*If the entry in Column 2 is less than the entry in Column 4, write "0" in Column 5.
**If the "Highest Number Previously Paid For" IN THIS SPACE is less than 10, write "10" in this space.

☒ A check in the amount of $ 56.00    is attached. for late filing of
                                                       amendment

☐ Charge $          to Deposit Account No. _____. A duplicate
copy of this sheet is enclosed.

Please charge any additional fees or credit overpayment to Deposit Account No.
   05-1675   . A duplicate copy of this sheet is enclosed.  This is a general
authorization which includes any fees under 37 CFR 1.16 -
1.18 for the entire pendency of the application.

                              LUCAS & JUST

                              _____
                                   Attorney of Record
                              David L. Just
                              Registration No. 25,687

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(212) 682-4980

PATENTS

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Francis deS. Lynch et al.          Docket No. A-29F-A

Serial No. 713,298                 Group Art Unit:  131

Filed:  March 18, 1985             Examiner:  C. Weston

For:  GOLF BALL DIMPLE SPATIAL RELATIONSHIP

I hereby certify that this correspondence is being deposited with
the U. S. Postal Service as first class mail in an envelope address-
ed to: Commissioner of Patents and Trademarks, Washington,
D. C. 20031 on  1-12-87

......................    .....*Clty*........    .............................    205 East 42nd Street
William D. Lucas          David L. Just                                         New York, New York   10017
Atty/R.N. 17,721          Atty/R.N. 25,687                                      January 12, 1987

Hon. Commissioner of Patents and Trademarks
Washington, D.C.   20231

Sir:

     This is in response to the Office Action dated

September 10, 1986.

          In the Claims:

     Cancel claims 26-29 and 31-34 without prejudice.


                    REMARKS

     The applicants' invention relates to golf balls and,

in particular, to a method for manufacturing a golf ball

which has superior distance in flight.

     In the latest Office Action, the Examiner has entered

rejections under 35 U.S.C. 112 and 35 U.S.C. 103.  With

respect first to the rejection under 35 U.S.C. 112, it


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is noted that no objection was made to claims 35-42.
In light of this, claims 26-29 and 31-34 have been cancelled.
This cancellation is without any prejudice to the applicants'
rights to the inventions defined therein.

With respect to the remaining claims 35-42, the Examiner
has rejected them under 35 U.S.C. 103 on the basis of
Martin, Shaw, and Badke in view of Smith.  Smith has been
cited only for the molding of golf balls; applicants readily
agree that it is conventional to mold dimples into the
surface of a golf ball.

This leaves us with a combination of Martin, Shaw,
and Badke which the Examiner alleges teach "how to select
the number of dimples, the diameter and depth of the dimples
and place the dimples on a golf ball." (emphasis added).
Inquiry is made as to exactly those portions of the cited
references on which the Examiner relies to teach how to
determine the dimple number, dimple diameter, and dimple
depth as set forth in subsection (B) and the dimple placement
as set forth in subsection (C) of applicants' claims 35
and 40.  The critical aspect of the applicants' claimed
invention is selecting the dimple number, dimple diameter,
dimple depth, and dimple spacing as set forth in subsections
(B) and (C) of claims 35 and 40.  It is only when the
method includes selection of the critical limitations
according to these subsections that the advantages of
the present invention are achieved.  Since none of the

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references, whether taken alone or in combination, suggests

the applicants' critical limitations, it is respectfully

submitted that applicants' claims as presented herewith

are allowable.

The Examiner has requested that applicants submit

the same materials as submitted in application Serial

No. 213,056. Applicants submit the same (or, where

appropriate, portions of the same) herewith. For ease

of use by the Examiner, the various papers have been submitted

in the form of a book. Please note that the "Remarks"

of item 1 of the book have been verified as shown in item 2

of the book.

APPLICANT PETITIONS FOR ACCEPTANCE
OF THIS LATE-FILED DOCUMENT AND
ENCLOSES THE FEE OF $56.00 THEREFOR.
IF THIS FEE IS INSUFFICIENT ANY
ADDITIONAL FEES MAY BE CHARGED TO
OUR DEPOSIT ACCOUNT NO. 08-1675

Respectfully submitted,

LUCAS & JUST

By_____
    David L. Just
    Registration No. 25,687

DLJ:jah

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-3-

H729861

att to
#6

FILED IN SUPPORT OF APPLICATION:
Serial No.:  713,298
Filing Date:  March 18, 1985

LUCAS & JUST
205 EAST 42nd STREET
NEW YORK, NEW YORK 10017

Documents From Application Serial No. 213,056

1.  Remarks and Exhibits from Amendment dated March 10, 1986 and filed March 13, 1986.

2.  Affidavit filed April 14, 1986 by W. Gobush verifying (with corrections) the Remarks filed March 10, 1986.

3.  Dimple depth/diameter plots filed August 18, 1986.

4.  Remarks from Amendment filed April 27, 1984.

5.  Lynch Affidavit dated April 15, 1974.

6.  Lynch Affidavit dated January 10, 1975.

7.  Lynch Affidavit dated February 29, 1980.

8.  Forbush Affidavit dated March 4, 1980.

9.  Shapiro Affidavit dated July 10, 1980.

10. Affidavits by 13 golf professionals executed in April or September 1980.

## REMARKS

For a great number of years prior to the making of
the present invention, virtually all golf balls had the
same dimple pattern and dimple size. This was due to
a realization that the art had "peaked" in terms of what
could be done to improve golf ball aerodynamics. This
is described on pages 128 and 129 of J.S. Martin's book,
The Curious History of the Golf Ball (Horizon, 1968).
Consistent with this teaching, virtually all golf ball
manufacturers used substantially identical dimple patterns
and substantially identical sized dimples, i.e. 332 to

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338 dimples, each with a diameter of about 0.127 inch
and a depth of about 0.13 inch.

While there were some attempts to change either the
dimples or the golf ball pattern, these met with great
resistance from the golfing public and, to the knowledge
of applicants, until the time of the present invention
there were no successful innovations in golf balls. One
of the biggest pushes to innovate a new form of dimple
was made in the middle 1950's by the U. S. Rubber Company
which came out with the Royal Special golf ball. This
ball was characterized by square dimples rather than round
ones, but still laid out in the same pattern as were round
dimples on standard golf balls. While a great deal of
money was spent in promoting this, it was found to make
a poor golf ball and was discontinued shortly after introduction.

In about 1969 John Jepson, one of the applicants
herein, decided that a scientific golf ball program should
be developed to see whether or not there were changes
which could be made in the aerodynamics of a golf ball
to increase the distance which a golf ball would travel,
all other factors being held the same.

For the purpose of carrying out the golf ball program
Jepson hired a number of employees. Among these were
his co-inventors herein, Francis DeS. Lynch and Robert
A. Brown. The three of them worked together on the aerodynamics
program because of their respective backgrounds. Jepson

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had graduated from Yale University in 1958 with a Ph.D.
in Mechanical Engineering and had worked for over 10 years
in research at the Bell Telephone Laboratories. Lynch
had received a Doctor of Science in Mechanical Engineering
from the Massachusetts Institute of Technology in 1968
and, while working towards same, had been engaged as an
engineering consultant. Brown received a Bachelor of
Arts degree from Brown University in 1960 and had almost
10 years experience in design engineering. These three
were responsible for the ideas behind the aerodynamic
program which resulted in the invention of the instant
patent application. They carried out work together and,
under their direction, work was also done by other engineers,
technicians and outside consultants.

At that time in history, the golf ball considered
to be the longest was the golf ball which had the greatest
carry off the tee. In extensive tests, it was found that
the TITLEIST K-2 ball carried further than all other golf
balls off the tee, all factors being equal.

In order to carry out comparative tests, solid nylon
golf balls were employed. As brought out in the earlier
filed Lynch affidavit, nylon balls, instead of actual
molded balls, were employed for the following reasons:

    A.   All of the balls could be made from the same
           stock thereby eliminating difficulties which
           would be encountered with molded balls, such

as varying density of material, slight variation
in golf ball diameter, and the like.

B.  Nylon cuts extremely well and true whereas molded
covers are resilient and subject to uneven cutting
and melting during high speed cutting.

C.  A nylon ball can be used as cut and it is not
necessary to compression or injection mold the
ball as is done with standard golf balls.  Molding
can result in minor statistical differences due
to eccentricity of centers, hot spots in the
mold, buffing lines, etc.

D.  The only properties to be tested on the golf
balls were aerodynamic properties and therefore
the only important feature of each golf ball
was its aerodynamic configuration and not its
internal construction.

Each golf ball made according to the foregoing was tested
for aerodynamic properties in a wind tunnel.  As also
brought out in the Lynch affidavit, wind tunnel tests
were employed for the comparison instead of actual driving
tests for the following reasons:

A.  In an actual driving test, even on a "perfect"
day, atmospheric changes are constantly taking
place.  These atmospheric changes include density
of air, moisture in the air, wind direction,
wind velocity, and the like, all of which affect

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the performance of a golf ball.  Furthermore,
there are other inherent deviations which are
always present which require a very large repeat
of tests to arrive at statistically significant
results.  Included among these other deviations
are the following:

    a.  The actual force with which the ball is
        struck.  Even where a "mechanical" golfer
        is employed, there can be variations in
        the actual impact force between different
        shots.

    b.  The physical characteristics of the ball.
        Even the best quality-control standards
        cannot eliminate all differences in the
        physical characteristics of golf balls
        and varying physical characteristics can
        affect the distance a golf ball will travel
        irrespective of its dimple pattern and
        configuration.

    c.  Distortion of the ball on impact.  Depending
        on exactly where the ball is hit, one
        or more dimples can be distorted or the
        ball can even be made egg shaped which
        can affect the distance a ball will travel.

    d.  Ability for a particular ball to be retested.
        Once a ball has been hit, its mechanical

-7-

properties change and it will not have
exactly the same flight pattern the next
time it is hit.  This can be because of
cracking of the cover, snapping of the
bands of the winding, change of the ball
into a permanent eccentric set, or the
like.

B.  In contrast to this, the conditions and operating
parameters in a wind tunnel can be exactly controlled
and exactly duplicated for each of a series of
tests.  The deviations of actual driving tests
can be substantially eliminated in a wind tunnel,
thereby reducing the number of tests which must
be run to obtain statistically significant values.

C.  The applicants found, by extensive testing of
golf balls in wind tunnels and in actual driving
tests, that the results are correlatable.  What
is meant by this is that a golf ball tested in
the wind tunnel is shown to go further than another
golf ball tested in the wind tunnel, the percentage
increase result in the wind tunnel was statistically
insignificant from the percentage increase result
of driving tests.

There now follows a discussion of the wind tunnel
tests.  The wind tunnel itself is a low turbulence, subsonic
wind tunnel having a wind speed range from 0 to 250 feet

-8-

per second.  The wind tunnel has associated with it

instrumentation for monitoring wind speed, air pressure,

barometric pressure, temperature, air density and air

viscosity.  In addition, there is a ball spinning and

dropping mechanism mounted above the test section of the

wind tunnel which permits the operator to set a ball spinning

with its spin axis parallel to the ground and perpendicular

to the wind velocity direction.  This device is capable

of spinning the ball at speeds up to 10,000 revolutions

per minute and more.  There is a camera mounted external

to the wind tunnel and sighted normal to the ball drop

plane.  This camera is used for photographing the ball

as it drops to give a reading of position versus time

of the ball dropping through the wind tunnel at a particular

spin rate and a particular wind velocity.

The applicants' experimental evidence showed that

over the course of flight of a ball, it encounters speeds

from approximately 50 to 255 feet per second during its

carry stage and encounters spin rates in the neighborhood

of 1,000-4,000 revolutions per minute during the carry

stage.  In order to form a plot of velocities and spin

rates versus drag and lift coefficients so that the trajectory

of the ball could be determined as hereinafter more fully

explained, the applicants selected eight relatively equally

spaced wind velocities within the ranges previously mentioned

and, at each of these velocities, selected four relatively

-9-

evenly spaced spin rates. For each specific velocity and spin rate, five separate but identical balls were tested by dropping them in the wind tunnel and using time lapse photography to record the movement of the ball as to time and both horizontal and vertical position. A typical time lapse photograph is attached as Exhibit A. The photographs were then used for determining the lift and drag forces on the balls. Computation of lift and drag is well known in the art.

The wind velocities were then converted to Reynolds numbers in known manner since Reynolds numbers are non-dimensional and eliminate such variables as temperatures, pressure, air density and air viscosity. A plot was then made of Reynolds numbers and spin rate versus lift and drag forces for each particular ball.

The distance which a ball will actually travel can be determined from the plot described in the previous paragraph using Newton's laws of motion. A particular spin rate and wind velocity are selected as the initial starting point. Where a number of balls are to be compared (as in the instant case), the same initial wind velocity and spin rate are employed. The initial spin rate and velocity (corrected to Reynolds number) which the applicants employed was that which they have found in a large number of tests to be that which is usually encountered by the ball when struck by a one wood. These numbers have not

been set forth because they are not necessary to an understanding

of the tests and are considered to be proprietary information

of Acushnet Company, the assignee of the instant application.

From the initial spin rate and velocity (Reynolds number)

the spin rate and velocity which the ball will have according

to Newton's laws of motion were computed at 0.1 second

intervals and, by interpolating these to find the lift

and drag forces at each interval from the plot measured

as described in the previous paragraph, the distance which

the golf ball will "carry" under ideal conditions was

determined.  The term "carry" is used in its normally

accepted golfing parlance, i.e. the initial flight of

a ball from the tee until it strikes the ground.

A great many factors were varied in analyzing the

golf balls.  These factors included the number of dimples,

the configuration of the dimples, the positioning of the

dimples, the depth of the dimples, and the diameter of

the dimples.  From an analysis of this initial data it

was determined that one of the primary considerations

was that the dimples be positioned as evenly as possible

over the surface of the golf ball.  A modified icosahedron

pattern was selected as best achieving this result on

a golf ball.  A true icosahedron could not be used because

it would have dimples at the parting line of the golf

ball mold which would be impossible to buff.

With the modified icosahedron pattern, dimples can

-11-

be most conveniently laid out in numbers of 182, 252, 332 and 392 and thus these numbers of dimples were used in the further testing.  A large number of golf balls were made with each of these numbers of dimples and with varying dimple depths and dimple diameters.  A group of six golf balls was made up for each set of parameters. All of the groups of golf balls were then subjected to wind tunnel testing.  The results of the wind tunnel tests were analyzed as previously discussed and carry yardage for the golf balls were determined.

The results of these tests are set forth in the summary sheets of Exhibit B annexed hereto which show number of dimples, dimple diameter, dimple depth and carry yardage. The following comments are made with respect to the summary tables of Exhibit B.

A.   Each of the results is the average of tests of five separate balls.  Each of the five balls was tested at eight velocities and four spin rates as discussed above.  Thus, each data entry is based on analysis of 160 separate data points.

B.   Certain information has been deleted from the summary tables of Exhibit B because it is not necessary to an understanding of the invention.

C.   The "336 (Atti)" balls were not made according to the present invention.

D.   The dimple dimensions are set forth in inches.

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The summary results of Exhibit B were compared to
the TITLEIST K-2 golf ball.  The TITLEIST K-2 golf ball
has a wind tunnel carry distance of 238 yards.  Consultations
were had with a number of golf professionals about what
would be considered a significant improvement in carry
distance and the consensus was that an improvement of
2-3 yards would be significant.  Affidavit evidence of
this was previously made of record.  On the basis of this,
a 3 yard improvement was selected as the minimum acceptable
value.

Plots were then prepared interrelating the essential
values of dimple number, dimple depth and dimple diameter
for 182, 252, 332, and 392 dimples.  For each point plotted
the carry distance was included for reference.  Using
standard curve fitting techniques, a curve was drawn to
indicate the relationships of those dimple depths and
dimple diameters which would give a statistically predictable
carry distance of at least 3 yards greater than the TITLEIST K-2
golf ball.  The curves were found to be ellipses.

The shapes of the curves drawn for the golf balls
with 182, 252, 332 and 392 dimples were found to be similar,
but they were not of the same size nor did they have the
same center point.  Exhibits C and D show the ellipsoid
curves of 332 and 392 dimples respectively.  It is proposed,
subject to approval by the Examiner, that each of these
curves be submitted as a drawing in the application.

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From analysis of the four curves, it was apparent that they were interrelated and formed a geometric solid similar in shape to a windsock. It was desired to express in formula form the interrelationship of dimple number, dimple depth and dimple diameter. It is known that the equation for a basic ellipse
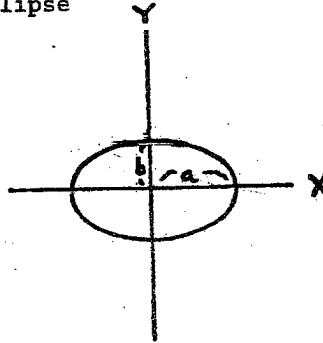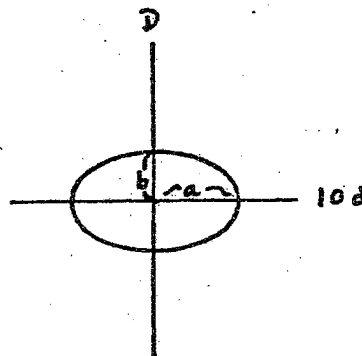
is as follows:

$$\frac{X^2}{a^2} + \frac{Y^2}{b^2} = 1$$

This is shown on pages 172 and 173 in the book Plane Analytic Geometry which are annexed as Exhibit E.

For ease of reference, D and 10d were used as the axes (for diameter and depth respectively) rather than X and Y. 10d is used rather than d alone because the depths are very small values and the ellipses would be difficult to draw using d rather than 10d. The ellipse thus can be drawn:

-14-

and the equation for this ellipse is:

$$\frac{(10d)^2}{a^2} + \frac{D^2}{b^2} = 1$$

It can be seen from Exhibits C and D, however, that the ellipses are rotated with respect to the axes. It is therefore necessary to use axes U and V to show this rotation. This is as follows:
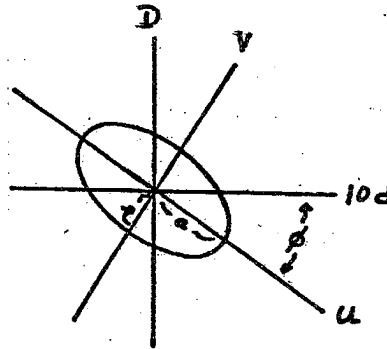


The equation for this rotated ellipse with axes U and V is:

$$\frac{U^2}{a^2} + \frac{V^2}{b^2} = 1$$

It is known that rotated axes U and V can be rewritten as a function of the axes D and 10d as follows:

$$U = 10d \cos \phi + D \sin \phi$$
$$V = -10d \sin \phi + y \cos \phi$$

-15-

This is shown on page 291 of the book <u>Calculus with Analytic</u> <u>Geometry</u>, which is attached as Exhibit F. When these values are substituted into the equation, the equation for the rotated ellipse in terms of axes D and 10d is as follows:

$$\left[\frac{10d\cos\phi + D\sin\phi}{a}\right]^2 + \left[\frac{-10d\sin\phi + D\cos\phi}{b}\right]^2 = 1$$

In the ellipses set forth in Exhibit C and D, the angle $\phi$ is $-33.75°$. For this angle, the sine and cosine are as follows:
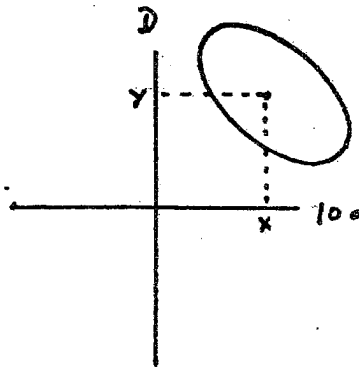
$$\cos\phi = 0.8315$$
$$\sin\phi = -0.5556$$

When these values are substituted into the equation, and the equation is rearranged for simplicity, the equation is as follows:

$$\left[\frac{0.8315(10d) - 0.5556D}{a}\right]^2 + \left[\frac{0.8315D + 0.5556(10d)}{b}\right]^2 = 1$$

This is the equation for the rotated ellipse.

However, the ellipses of the invention are not only rotated, they are also translated from the origin. This can be represented as follows:

wherein the center point of the ellipse is translated

from the origin by distances x and y along the 10d and

D axes respectively. With respect to the origin, the

translated centerpoint of the ellipse can be written as

10d-x and D-y. Substituting these values into the next

previous equation and combining the constants gives the

following equation:

$$\left[\frac{8.315\,(d-x) - 0.556(D-y)}{a}\right]^2 + \left[\frac{0.8315(D-y) + 5.556(d-x)}{b}\right]^2 = 1$$

This equation is the equation for each of the ellipses.

However, since the various ellipses do not have the same

center points or the same values of a and b, it is necessary

to include these variables in the equations. The translated

values x and y and the length values a and b can be interrelated

by plotting each of these values against dimple numbers.

These plots are shown in attached Exhibits G-J. While

it would be possible to write an equation to include all

of the curves shown in Exhibits G-J, it was considerably

less complicated to break the curves into two components

at 332/333 dimples. Equations were then written for each

-17-

of a, b, x and y with respect to the dimple number divided
by 100 (for simplicity), and these equations are as follows:

for 182-332 dimples

$$a = 0.0630 - 0.0330N + 0.00693N^2$$

$$b = 0.0311 - 0.0103N + 0.0155N^2$$

$$x = 0.0186 - 0.00406N + 0.00050N^2$$

$$y = 0.323 - 0.896N + 0.0122N^2$$

for 333-392 dimples

$$a = 0.0455 - 0.00500N$$

$$b = 0.0500 - 0.0108N$$

$$x = 0.0162 - 0.00150N$$

$$y = 0.287 - 0.0383N$$

Because the values of a and b are so small, decision was
made to increase their values by a factor of 100. This,
naturally, required that the numerator of the equation
also be increased by 100. (No increase was made in the
values of x and y since they relate to the very small
values of d and D and increasing x and y by a factor of
100 would have complicated the formula rather than simplifying
it.) With this adjustment, the final equation interrelating
dimple number, dimple depth and dimple diameter is as
set forth in the claims of the application, namely:

$$\left[\frac{831.5\,(d-x) - 55.56\,(D-y)}{a}\right]^2 + \left[\frac{83.15\,(D-y) + 555.6\,(d-x)}{b}\right]^2 = 1$$

-18-

wherein:

N is the exact number of dimples divided by 100,

y, x, a and b are individually defined by the

following equations

$$y = 0.323 - 0.0896N + 0.0122N^2$$

$$x = 0.0186 - 0.00406N + 0.00055N^2$$

$$a = 6.30 - 3.30N + 0.693N^2$$

$$b = 3.11 - 1.03N + 0.155N^2$$

when the dimples number 182 to 332, and by the

following equations

$$y = 0.287 - 0.0383N$$

$$x = 0.0162 - 0.00150N$$

$$a = 4.66 - 0.500N$$

$$b = 5.00 - 1.08N$$

when the dimple number of 333 to 392.

The equation of the above describes the various ellipses
which make up the series of ellipses of the present invention.
In each case, a relationship of dimple number, dimple
diameter and dimple depth on the perimeter of or within
the ellipses will have carry yardage of 3 or more yards
than the TITLEIST K-2. Since the situation exists that
when the equation = 1 the perimeter of the ellipse is
defined, the situation also exists that when the equation
equals less than 1 a point within the ellipse is defined.
It is a given that two squared numbers added together
must equal zero or a positive number. Therefore, a point within
the ellipse is defined by the equation being 1 or some

lesser number down to 0 (0 being the center of the ellipse where d = x and D = y, in which case the equation will work out to 0). If a point is outside the ellipse, the equation will have a value greater than 1. This is the basis for the equation in the claim stating that S (the sum of the two parts of the equation > 0 < 1. To summarize, S = 1 defines points on the perimeter of the ellipse, S < 1 defines points within the ellipse, S = 0 defines the center of the ellipse, S < 0 cannot exist, and S > 1 is outside the ellipse and thus outside the claimed invention.

It was recognized that in addition to interrelating dimple number, dimple diameter and dimple depth it was also necessary to lay the dimples out substantially evenly on the surface of the golf ball and still provide for a parting line at the equator for buffing. It was recognized, for example, that placing all of the dimples on one hemisphere of the golf ball would make the ball fly like a WIFFLE ball. At the same time, it was found that rearranging dimples for the parting line or rearranging or removing some dimples for the traditional nameplate and number did not noticeable detract from distance. In considering these factors, the layout of the dimples on the prototype balls was analyzed and it was found that the center-to-center spacing of adjacent dimples varied. A plot of these center-to-center spacings was prepared and such a plot is attached as Exhibit K. In this plot, the maximum

-20-

center-to-center spacing for adjacent dimples was compared

to the smallest dimple diameters for that number of dimples

as shown on Exhibits C and D since this resulted in the

greatest distance between the edges of adjacent dimples.

These comparisons are as follows:

| Number of Dimples | Maximum Center Spacing* | Minimum Dimple Diameter* | Maximum Distance Between Edges of Adjacent Dimples* |
|---|---|---|---|
| 182 | 0.245 | 0.182 | 0.063 |
| 252 | 0.223 | 0.156 | 0.067 |
| 332 | 0.205 | 0.138 | 0.067 |
| 392 | 0.185 | 0.120 | 0.065 |

* in inches

Taking the maximum distances between the edges of adjacent

dimples and rounding off to the nearest 0.005 inches resulted

in a maximum distance spacing of 0.065 inches, the value

used in the claims.  The 20% tolerance (i.e. at least

80% have less than the 0.065 inches maximum specified

distance between adjacent dimples) is based on adjustments

for rearrangement of the dimples at the equator, the trademark

and numbering areas and other minor adjustments which

were found to be statistically insignificant in terms

of the improved yardage.

The distance and percentage of the closest points

of the edges of adjacent dimples was determined in a similar

manner.  The 0.001 limitation was selected because it

is the smallest value which could be accurately measured

with suitable equipment for dimple measuring in existence

at the time of the present invention.  The 55% limitation

-21-

on minimum spacing was based on center-to-center distance
versus maximum dimple diameter.  It was found that, to
the nearest 5%, 55% of the dimples did not overlap, i.e.
were no closer than 0.001 inches.

Golf ball aerodynamics according to the present invention
were adopted for use on the TITLEIST golf ball in 1973
and proved time and time again to be the longest golf
ball off the tee.  One of the best criterion for what
golf professionals consider to be the longest driving
ball is the ball which they use in the National Long Driving
Championship.  Because of the dominance of the TITLEIST
golf ball, this competition changed its format in 1980
to using a single brand of golf ball selected at random.
Prior to 1980, each contestant was permitted to choose
the brand of golf ball with which he wanted to compete.
Since 1973, the TITLEIST golf ball has been the most played.
During the 1978 National Long Driving Championship the
top four competitors all used the TITLEIST golf ball ball
produced in accordance with the present invention.  In
fact, of the 1st through 14th place finishers, 13 of them
used the TITLEIST ball.  Similarly, the top two competitors
in the 1979 National Long Driving Championship used the
TITLEIST golf ball as did 16 of the top 17 finishers in
the competition.  While many golf ball manufacturers contract
with players to have their golf balls used by the players,
Acushnet Company has never followed this policy and not
one of the competitors in the National Long Driving Championship
was obligated by Acushnet Company to use the TITLEIST
golf ball.

Another indication of the superior distance travelled by golf balls made according to the present invention is action taken by the United States Golf Association with respect thereto. Until the mid 1970's, the United States Golf Association specifications for golf balls were limited to three requirements:

1. A minimum diameter of 1.680 inches.

2. A maximum weight of 1.620 ounces avoirdupois.

3. ~~An initial velocity not greater than~~ 250 feet per second (2% tolerance) when measured on the United States Golf Association's apparatus at 75°F.

These rules had remained unchanged for a great number of years. However, when Acushnet Company came out with its TITLEIST golf ball according to the teaching of the present invention, it was such a long ball that the United States Golf Association added an additional limitation that golf balls could not travel more than 280 yards (4% tolerance) when tested on the United States Golf Association machine. The travel includes both carry and roll. It is generally recognized in the trade that the United States Golf Association based its maximum yardage allowable on the yardage travelled by the TITLEIST golf ball under the United States Golf Association testing conditions.

In addition to the foregoing, it was also agreed that applicant would determine whether they could submit

-23-

a Rule 131 affidavit to swear back of the Martin '716

reference.  It is hereby confirmed that applicants are

entitled to do so.  A Rule 131 affidavit will be filed

in due course.

Applicants agreed to delete the word "about" wherever

it appears in the claims.  The same has been done herewith.

This agreement was based on the Examiner's position that

the word is unnecessary under the doctrine of equivalents.

It was noted that the square sign appeared inside

the brackets in the formula of claim 54 when it should

have been outside the brackets and that change has been

made herewith.

The Examiner indicated that final allowance would

be predicated on submission of drawings showing each of

the dimple numbers claimed.  In addition to the offer

of drawings consistent with each of Exihibits C and D

hereof, applicant agrees to submit drawings showing each

of the specifically claimed number of dimples upon indication

of otherwise allowability of the application.

During the interview, the Examiner agreed to reconsider

the affidavits currently of record.  The Examiner has

previously indicated (Paper No. 10) that the affidavits

of Ascher Shapiro and the twelve Golf Professionals are

persuasive for their intended purposes.  With particular

respect to the affidavits of Forbush and Lynch, it was

emphasized at the interview that they are not intended

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to overcome "structural obviousness".  They are directed
to the "invention as a whole" and the non-obviousness
of the unexpected results of superior driving distance
attained with golf balls made according to the teachings
of the present invention.

On the basis of the foregoing and the previous submissions
in this application, reconsideration and allowance are
respectfully requested, subject only to finalization of
~~the drawings.~~

<div align="right">

Respectfully submitted,

LUCAS & JUST


By_____
        David L. Just
    Registration No. 25,687

</div>

DLJ:jah

(212) 682-4980

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# EXHIBIT T

PATE..S

205 East 42nd Street
New York, New York 10017
June 3, 1987

In re application of   Francis deS. Lynch et al.          DOCKET: A-29F-A

Serial No.    713,298                                      Group Art Unit: 331

Filed     March 18, 1985                                   Examiner: C. Weston

For   GOLF BALL DIMPLE SPATIAL RELATIONSHIP


THE COMMISSIONER OF PATENTS
Washington, D.C. 20231 .

Sir:

Transmitted herewith is an amendment in the above-identified application.

☐ No additional fee is enclosed because this application was filed prior to
October 25, 1965 (effective date of Public Law 89-83.)

☐ No additional fee is required.

The fee has been calculated as shown below.

| (1) | (2) CLAIMS REMAINING AFTER AMENDMENT | (3) | (4) HIGHEST NO. PREVIOUSLY PAID FOR | (5) PRESENT EXTRA | (6) RATE | (7) ADDITIONAL FEE |
|---|---|---|---|---|---|---|
| TOTAL CLAIMS | 48 | MINUS | 20 | = 28 | X 12.00 | x $336.00 |
| INDEP. CLAIMS | 2 | MINUS | 4 | = 0 | X 34.00 | x |
| | | | | TOTAL ADDITIONAL FEE FOR THIS AMENDMENT➤ | | . $336.00 |

CLAIMS AS AMENDED

*If the entry in Column 2 is less than the entry in Column 4, write "0" in Column 5.
**If the "Highest Number Previously Paid For" IN THIS SPACE is less than 10, write "10" in this space.

☒ A check in the amount of $ 336.00      is attached.

☐ Charge $            to Deposit Account No. _____ . A duplicate
copy of this sheet is enclosed.

Please charge any additional fees or credit overpayment to Deposit Account No.
05-1675 . A duplicate copy of this sheet is enclosed.  This is a general
authorization which includes any fees under 37 CFR 1.16 -
1.18 for the entire pendency of the application.

If any petition for extension of time is required by 37 CFR 1.136
and is not otherwise requested herein, applicant hereby so petitions
and authorizes the fee therefor to be charged against Deposit
Account No. 05-1675.

LUCAS & JUST


DLJ:pd                        By _____
                                        Attorney of Record
(212) 682-4980                    David L. Just
                                  Reg. No. 25,687

336-⅍ 103

PATENTS

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Francis deS. Lynch et al.          Docket No. A-29F-A

Serial No. 713,298               Group Art Unit: 131

Filed:  March 18, 1985           Examiner:  C. Weston

For:  GOLF BALL DIMPLE SPATIAL RELATIONSHIP

I hereby certify that this correspondence is being deposited with
the U. S. Postal Service as first class mail in an envelope address-
ed to: Commissioner of Patents and Trademarks, Washington,
D. C. 20931 on  June 10, 1987                              205 East 42nd Street
                                                          New York, New York  10017
                                                          June 9, 1987
—————————    —————————
William D. Lucas     David L. Just
Atty/R.N. 17,721     Atty/R.N. 25,682

Hon. Commissioner of Patents and Trademarks
Washington, D.C.   20231

Sir:

     This is in response to the Office Action dated

May 7, 1987.  Please amend the above-identified application

as follows:

     In the Claims:

     Please cancel claims 38-42 without prejudice.

     Please add the following new claims:

     --43.  The method of claim 35 wherein the dimples

are circular.

     44.  The method of claim 35 wherein the selected

number of dimples is from 182 to 332 and x, y, a and b

are defined by the following relations as functions of N:

$$y = 0.323 - 0.0896N + 0.0122N^2$$

$$x = 0.0186 - 0.00406N + 0.000550N^2$$

$$a = 4.54 - 2.78N + 0.674N^2$$

$$b = 3.09 - 1.97N + 0.412N^2$$

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45.  The method of claim 44 wherein the positioning of the selected dimples in the surface of the golf ball is such that 100% of the closest distances between the edges of adjacent dimples is less than 0.065 inches.

46.  The method of claim 44 wherein the positioning of the selected dimples in the surface of the golf ball is such that 100% of the closest distances between the edges of adjacent dimples is greater than 0.001 inches.

47.  The method of claim 44 wherein the dimples are circular.

48.  The method of claim 35 wherein the selected number of dimples is from 333 to 392 and x, y, a and b are defined by the following relations as functions of N:

$$y = 0.287 - 0.0383N$$
$$x = 0.0162 - 0.00150N$$
$$a = 4.66 - 0.500N$$
$$b = 5.00 - 1.08N.$$

49.  The method of claim 48 wherein the positioning of the selected dimples in the surface of the golf ball is such that 100% of the closest distances between the edges of adjacent dimples is less than 0.065 inches.

50.  The method of claim 48 wherein the positioning of the selected dimples in the surface of the golf ball is such that 100% of the closest distances between the edges of adjacent dimples is greater than 0.001 inches.

51.  The method of claim 48 wherein the dimples are circular.

52.  The method of claim 35 wherein the selected number of dimples is from 182 to 332 and x, y, a and b are defined by the following relations as functions of N:

$$y = 0.323 - 0.0896N + 0.0122N^2$$

$$x = 0.0186 - 0.00406N + 0.000550N^2$$

$$a = 6.30 - 3.30N + 0.693N^2$$

$$b = 3.09 + 1.97N + 0.412N^2.$$

53.  The method of claim 52 wherein the positioning of the selected dimples in the surface of the golf ball is such that 100% of the closest distances between the edges of adjacent dimples is less than 0.065 inches.

54.  The method of claim 52 wherein the positioning of the selected dimples in the surface of the golf ball is such that 100% of the closest distances between the edges of adjacent dimples is greater than 0.001 inches.

55.  The method of claim 52 wherein the dimples are circular.

56.  The method of claim 35 wherein the selected number of dimples is from 333 to 392 and x, y, a and b are defined by the following relations as functions of N:

$$y = 0.240 - 0.0242N$$

$$x = 0.0225 - 0.00340N$$

$$a = 13.6 - 3.28N$$

$$b = 5.25 - 1.25N.$$

57.  The method of claim 56 wherein the positioning of the selected dimples in the surface of the golf ball is such that 100% of the closest distances between the edges of adjacent dimples is less than 0.065 inches.

-3-

58. The method of claim 56 wherein the positioning of the selected dimples in the surface of the golf ball is such that 100% of the closest distances between the edges of adjacent dimples is greater than 0.001 inches.

59. The method of claim 56 wherein the dimples are circular.

60. The method of claim 35 wherein the selected number of dimples is from 315 to 340 and x, y, a and b are as follows:

$$x = 0.0117$$
$$y = 0.156$$
$$a = 1.1$$
$$b = 0.55.$$

61. The method of claim 60 wherein the positioning of the selected dimples in the surface of the golf ball is such that 100% of the closest distances between the edges of adjacent dimples is less than 0.065 dimples.

62. The method of claim 60 wherein the positioning of the selected dimples in the surface of the golf ball is such that 100% of the closest distances between the edges of adjacent dimples is greater than 0.001 inches.

63. The method of claim 60 wherein the dimples are circular.

64. A method of manufacturing a golf ball having dimples in the outer periphery thereof comprising the steps of:

(A) selecting a golf ball structure onto the surface of which dimples can be molded;

P|  (B) determining the dimple number, dimple

diameter and dimple depth by:

P2  (a)  selecting the number of dimples to

be used, the said number of dimples being between

182 and 392;

P3  (b)  selecting a dimple diameter and dimple

depth that satisfy the following relationship:

T240X

$$S = [\frac{831.5(d-x)-55.56(D-y)}{a}]^2 + [\frac{83.15(D-y)+555.6(d-x)}{b}]^2$$

in which:

S = a value of 0 to 1.0

d = average depth of all dimples in inches

D = average diameter of all dimples in inches

and wherein:

a value N is obtained by dividing the exact

number of dimples by 100, and x, y, a and b

are defined by the following relations as functions

of N:

when the number of dimples is between 182

and 332:

$$y = 0.323 - 0.0896N + 0.0122N^2$$
$$x = 0.0186 - 0.00406N + 0.000550N^2$$
$$a = 6.30 - 3.30N + 0.693N^2$$
$$b = 3.11 - 1.03N + 0.155N^2$$

and when the number of dimples is between

333 and 392:

$$y = 0.287 - 0.0383N$$
$$x = 0.0162 - 0.00150N$$
$$a = 4.66 - 0.500N$$
$$b = 5.00 - 1.08N$$

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(C) making golf ball molds by positioning the
selected dimples on the golf ball mold so that the
surface of the golf ball made therefrom will have
at least 80% of the distances between the closest
points of the edges of adjacent dimples less than
about 0.065 inches, and at least 55% of the distances
between the closest points of the edges of adjacent
dimples greater than 0.001 inches the edge of the
dimples being defined as the point of intersection
of the periphery of the golf ball or its continuation
and a tangent to the sidewall of the dimples at a
point 0.003 inches below the periphery of the golf
ball or its continuation;

(D) forming the dimples on the surface of the
golf ball by molding a golf ball in the mold;

(E) removing the formed golf ball from the mold; and

(F) finishing the golf ball.

2. The method of claim 64 wherein the positioning
of the selected dimples in the surface of the golf ball
is such that 100% of the closest distances between the
edges of adjacent dimples is less than 0.065 inches.

3. The method of claim 64 wherein the positioning
of the selected dimples in the surface of the golf ball
is such that 100% of the closest distances between the
edges of adjacent dimples is greater than 0.001 inches.

4. The method of claim 64 wherein the dimples are
circular.

5 68. The method of claim 64 wherein the selected number of dimples is from 182 to 332 and x, y, a and b are defined by the following relations as functions of N:

$$y = 0.323 - 0.0896N + 0.0122N^2$$
$$x = 0.0186 - 0.00406N + 0.000550N^2$$
$$a = 4.54 - 2.78N + 0.674N^2$$
$$b = 3.09 - 1.97N + 0.412N^2.$$

6 69. The method of claim 68 wherein the positioning of the selected dimples in the surface of the golf ball is such that 100% of the closest distances between the edges of adjacent dimples is less than 0.065 inches.

7 70. The method of claim 68 wherein the positioning of the selected dimples in the surface of the golf ball is such that 100% of the closest distances between the edges of adjacent dimples is greater than 0.001 inches.

8 71. The method of claim 36 wherein the dimples are circular.

9 72. The method of claim 64 wherein the selected number of dimples is from 333 to 392 and x, y, a and b are defined by the following relations as functions of N:

$$y = 0.287 - 0.0383N$$
$$x = 0.0162 - 0.00150N$$
$$a = 4.66 - 0.500N$$
$$b = 5.00 - 1.08N.$$

10 73. The method of claim 72 wherein the positioning of the selected dimples in the surface of the golf ball is such that 100% of the closest distances between the edges of adjacent dimples is less than 0.065 inches.

11 ~74. The method of claim 9 wherein the positioning of the selected dimples in the surface of the golf ball is such that 100% of the closest distances between the edges of adjacent dimples is greater than 0.001 inches.

12 75. The method of claim 9 wherein the dimples are circular.

13 76. The method of claim 1 wherein the selected number of dimples is from 182 to 332 and x, y, a and b are defined by the following relations as functions of N:

$$y = 0.323 - 0.0896N + 0.0122N^2$$
$$x = 0.0186 - 0.00406N + 0.000550N^2$$
$$a = 6.30 - 3.30N + 0.693N^2$$
$$b = 3.09 - 1.97N + 0.412N^2.$$

14 77. The method of claim 13 wherein the positioning of the selected dimples in the surface of the golf ball is such that 100% of the closest distances between the edges of adjacent dimples is less than 0.065 inches.

15 78. The method of claim 13 wherein the positioning of the selected dimples in the surface of the golf ball is such that 100% of the closest distances between the edges of adjacent dimples is greater than 0.001 inches.

16 79. The method of claim 15 wherein the dimples are circular.

17 80. The method of claim 1 wherein the selected number of dimples is from 333 to 392 and x, y, a and b are defined by the following relations as functions of N:

$$y = 0.240 - 0.0242N$$
$$x = 0.0225 - 0.00340N$$
$$a = 13.6 - 3.28N$$
$$b = 5.25 - 1.25N.$$

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18 ~91. The method of claim 86 wherein the positioning of the selected dimples in the surface of the golf ball is such that 100% of the closest distances between the edges of adjacent dimples is less than 0.065 inches.

19 ~92. The method of claim 80 wherein the positioning of the selected dimples in the surface of the golf ball is such that 100% of the closest distances between the edges of adjacent dimples is greater than 0.001 inches.

20 ~93. The method of claim 90 wherein the dimples are circular.

21 ~94. The method of claim 80 wherein the selected number of dimples is from 315 to 340 and x, y, a and b are as follows:

$$x = 0.0117$$
$$y = 0.156$$
$$a = 1.1$$
$$b = 0.55.$$

22 ~95. The method of claim 94 wherein the positioning of the selected dimples in the surface of the golf ball is such that 100% of the closest distances between the edges of adjacent dimples is less than 0.065 dimples.

23 ~96. The method of claim 94 wherein the positioning of the selected dimples in the surface of the golf ball is such that 100% of the closest distances between the edges of adjacent dimples is greater than 0.001 inches.

24 ~97. The method of claim 94 wherein the dimples are circular.—End

## REMARKS

In the Office Action of May 7, 1987, the Examiner has allowed claims 35-39 and has rejected claims 40-42 as being of the same scope as claims 35-37. Applicant agrees with this position of the Examiner. Applicant has herewith cancelled claims 40-42 and, for the sake of clarity as discussed below, has cancelled claims 38 and 39.

A series of new claims has been submitted. Claims 43-63 are dependent on allowed claim 35. Claim 35 is a generic claim to 182-392 dimples and includes applicants' broadest formulas (formulas 1 and 2 on pages 4 and 5 of the specification) for selecting the interrelationship between dimple number, dimple diameter and dimple depth. The newly introduced claims dependent on claim 35 are drawn to narrower numbers of dimples and/or narrower formulas. The subject matter of allowed claims 38 and 39 has been reintroduced in the added claims. They have been "moved" solely for the purpose of making the entire set of claims orderly.

New claim 64 has been introduced. It is very similar to claim 40. The only changes in language are in sub-paragraphs (A), (D) and (E). As brought out on page 21 of the specification, the balls of the present invention include solid balls. In solid balls the dimples are formed as the solid ball or its cover is being formed. This is somewhat different from wound balls wherein golf balls are generally formed by putting half shells on the core and then the dimples are formed into surface of the golf

-10-

ball.  Claim 64 covers the situation in which dimples
are formed on the surface of the golf ball at the same
time that the surface is formed.  The claims depending
from claim 64 are identical to the claims dependent on
allowed claim 35.

Should the Examiner have any questions concerning
the claims presented herewith, he is respectfully requested
to call the applicants' undersigned attorney.

Allowance of all of the claims of this application
is respectfully requested.

Respectfully submitted,

LUCAS & JUST

DLJ:pd

(212) 682-4980

By _____
David L. Just
Reg. No. 26,687

DEPOSIT ACCOUNT
Authorization is given to charge any fee
due or credit for over-payment to our
Deposit Account No. 05-1675
A duplicate copy of this page is enclosed.

-11-